DETAILED ACTION

Response to Amendment

The claim amendment filed on 08/19/2011, addressing claims 2, 8-11, 13-16, and 18-25 rejection from the non-final office action (04/19/2011) by amending claims 2, 8-11, 13, 15-16, and 18-25 is entered, and will be addressed below.

Claim Objection

Claim 18 is objected for ending with double periods. Claim 23 is objected for "despositing" should be "depositing".

Appropriate correction is required.

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

1. Claims 2, 8-11, 15-16, and 18-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wu et al. (US 6045671, hereafter '671), in view of Koo et al. (US 5421973, hereafter '973) and Bright et al. (US 6312525, hereafter '525).

'671 teaches some limitations of:

Claim 21: A combinatorial sputtering system (Fig. 14, col. 25, lines 23-24) for deposition (col. 25, line 29) may be used for catalysis (col. 31, lines 10-11, the claimed "catalyst materials", note the different catalysts from the sputtering guns in order to screen the array for useful properties, col. 6, lines 6-7) using thin-film deposition techniques may include sputtering technique, electron beam or thermal evaporation, … (col. 19, lines 39-51, these are known physical vapor deposition, the claimed "a physical

vapor deposition system for depositing combinatorial catalyst materials samples"), the substrate is located within a substrate holder 132 which, in addition to holding the substrate, also locks one secondary masking pattern 134 firmly above the substrate 118 (col. 25, lines 41-34, the claimed "on a plurality of substrate target areas"):

a processing chamber 256 under vacuum (col. 22, lines 45-46, Fig. 12 clearly applicable to Fig. 14, the claimed "a deposition chamber"), a substrate load-lock chamber 262 (col. 22, line 50, the claimed "when open, receives one or more substrates and is sealable after the one or more substrates are loaded therein, the chamber being openable after the one or more substrates have been processed so that the one or more substrates with deposited catalyst samples can be removed therefrom");

eight RF magnetron sputtering guns 110 … inserted from the side of the reaction chamber in a complete circle (col. 25, lines 24-27, the claimed "a plurality of plasma sources radially disposed within the chamber"), for catalysis (col. 31, lines 10-11, the claimed "for depositing catalyst samples") with secondary masking pattern 134 firmly above the substrate 118 (col. 25, lines 41-34, the claimed "on the target areas of the one or more substrates"), simultaneously reacting the components to form at least two resulting materials (abstract, lines 6-7, the claimed "each gun configured for depositing a predetermined catalyst material onto a substrate target area");

a shaft 130 having linear and rotational motion (col. 25, lines 27-28) and during deposition, the substrate can be translated and rotated to face any one of the eight RF magnetron sputtering guns 110 (col. 25, lines 29-31, the claimed "a substrate assembly for controllably and selectively positioning one or more substrates within the deposition

chamber in order to selectively and sequentially align each of the target areas of the one or more substrates with one of said clusters of plasma guns, said substrate assembly rotationally and planarly moveable within the deposition chamber for aligning each of the target areas"; Note that linear motion and translational movement is a planarly movement);

a system 250 … includes a processor (col. 22, lines 66-67, the claimed "a programmably") film thickness and uniformity can be controlled by the spraying time, substrate-nozzle distance, … and/or positioning the spray gun, spray nozzle or substrate, etc. (col. 28, lines 25-28), a thickness monitors may provide feedback to the processor to control the deposition rate (col. 24, lines 57-59, as depositing rate is from the sputtering guns, the claimed "a control system programmably controlling the operation of each gun"), the power of two electron beam sources can be varied so that component A is delivered to the substrate in increasing or decreasing amounts while component B is either delivered in a constant amount or varied in the opposite direction of component A. (col. 18, lines 31-34, the claimed "the control system controlling (i) the amount of power to each gun to regulate a rate of catalyst material deposition"), film thickness and uniformity can be controlled by the **spraying time**, substrate-nozzle distance, … and/or positioning the spray gun, spray nozzle or substrate, etc. (col. 28, lines 25-28, the claimed "(ii) the amount of time of deposition for each catalyst material to be deposited on a target area" as the control is intrinsically associated with each spot).

'671's teaching of film thickness and uniformity can be controlled by the spraying time, substrate-nozzle distance, … and/or **positioning** the spray gun, spray nozzle or **substrate**, etc. (col. 28, lines 25-28), since the substrate is attached to a shaft 130 having linear and rotational motion (col. 25, lines 27-28) and during deposition, the substrate can be translated and rotated to face any one of the eight RF magnetron sputtering guns 110 (col. 25, lines 29-31), therefore, the movement of the shaft in the Z/axial rotation and x/vertical direction has to be coordinated with the sputtering guns 110. However, '671 does not explicitly teach the processor/control system also **controls** the vertical movement and axial rotation of the shaft does not explicitly teaches the linear motion in y direction.

'671 does not teaches the other limitations of:

Claim 21: (b) each of the plasma sources comprises a cluster of separately controllable, co-focused plasma guns, each gun of a cluster (configured for depositing a predetermined catalyst material onto a substrate target area) aligned with the cluster,

(d) (a control system programmably controlling) the movement of the substrate assembly for alignment of the target areas with the clusters of plasma guns, (iii) rotational movement of the substrate assembly in order to align the substrate assembly with one of the radially disposed clusters of plasma guns, and (iv) planarly movement of the substrate assembly, in both x and y directions, in order to align an individual target area of a substrate with the same cluster of plasma guns such that the plasma guns of that cluster are co-focused on the aligned target area.

‘973 is an analogous art in the field of reactive sputtering deposition of thin films (title, similar to ‘671’s sputtering). ‘973 criticizes two-step process due to increased potential for contamination (col. 3, lines 17-21) and teaches three sputtering guns (two are shown) are concentrically mounted on the top of the chamber (pneumatically operated cover plate) focusing the substrate holder (col. 4, lines 16-22, Fig. 1), the substrate platform is positioned in the center of the chamber (focal point of all 3 sputtering guns) (col. 4, lines 27-29).

At the time of the invention was made, it would have been obvious to a person having ordinary skill in the art to have replaced **each of the sputtering guns 110** in Fig. 14 of ‘671 with the **three focused sputtering gun assembly** of ‘973 (the limitation of 21(b)), for the purpose of avoiding the contamination potential in two-step deposition, as taught by ‘973 (col. 3, lines 17-21) and simultaneous deposition required by ‘671 (col. 18, lines 28-38).

‘525 is an analogous art in the field of modular architecture for semiconductor wafer fabrication equipment (title) including PVD (col. 5, line 50). ‘525 teaches a modular control system 200 with a host controller 202 for controlling the **overall operation** of the modular vacuum system 10 (col. 11, lines 22-24) including wafer handling and environment management (col. 11, lines 47-48, see also Fig. 14) and a

user human/machine interface that provides the user with all of the commands for creating the desired vacuum system (col. 12, lines 45-50).

At the time of the invention was made, it would have been obvious to a person having ordinary skill in the art to have implemented a control system for controlling the overall operation of the system, as taught by '525, including the control of shaft in x, y, z directions, for the purpose of integral control of the system, including wafer handling (col. 11, lines 47-48). Therefore, to have had the control functions of the overall system in a program of the processor (the limitations of 21(d) (iii) and (iv)).

In a different embodiment (Fig. 5), '671 teaches the substrate may also be **translated** relative to the frame 206 so that shutter masks 202, 203 may be positioned at selected regions on the substrate (col. 17, lines 44-46) by moving the X--X and Y--Y shutter masks 202, 203 (col. 17, lines 40-41) and/or forming the two dimension pattern of Figs. 2-4. Therefore, needs a two dimensional motion mechanism.

At the time of the invention was made, it would have been obvious to a person having ordinary skill in the art to have added a two dimension motion mechanism (the limitations of 1(d)(iv)), as taught by Fig. 5 of '671, to the combined apparatus of '671 and '973, for the purpose of forming two dimensional pattern in Figs. 2-4 of '671.

For Claim 2: the control system includes inputted parameters, the parameters determining for each target area, the amount of power, the amount of time, and the characteristics of the catalyst sample to be deposited on the target area.

Claim 22: the control system positions the substrate assembly, selects the guns, and controls the amount of power and the duration of operation of the guns, such that different catalyst materials from the guns are applied to a given target area in at least one of a layer or a co-deposition.

Note the controlling of overall operation from '525 would have included all the operations of '671 (the limitations of claims 2 and 22). '671 further teaches the components may also form layers, blends or mixtures … on the substrate (col. 6, lines 4-5) the components can be delivered to predefined regions on the substrate …sequentially (col. 30, lines 44-46, therefore, "catalyst materials are deposited on the target areas in layers in a programmed number of cycles").

'671 further teaches the resulting material include inter-metallic material, metal alloys (col. 9, lines 21-22, the claimed "each of the catalyst material is a metal") the resulting materials may comprise a **single component** or a combination or **components** that have reacted directly with each other or with an external source (col. 8, lines 42-45, along with the imported overall system controller from '525, would have had the "the control system is configured for depositing catalyst samples comprising multiple layers with a single metal in each layer" of claim 23, "for co-depositing catalyst

materials to form ternary alloys" of claim 24, and "for co-depositing alternating layers of quaternary alloys" of claim 25).

In view of the pattern (col. 12, lines 44-50) in Figs. 1-2 of '671 also teaches the "the substrate assembly is configured for bearing a planar substrate having a plurality of target areas thereon are arranged in a matrix defined by columns and rows" of claim 8 and "the matrix comprises an equal number of columns and rows of target areas" of claim 9.

'671 further teaches a system 250 … includes a processor (col. 22, lines 66-67, the claimed "the control system") film thickness and uniformity can be controlled by the **spraying time**, substrate-nozzle distance, … and/or **positioning the spray gun**, spray nozzle or substrate, etc. (col. 28, lines 25-28, the claimed "configured to select 1) an ion emitted by each plasma gun within a cluster; 2) the amount of power and the duration of operation for the gun; and 3) the position of the substrate assembly, such that each target area is exposed to the plasma gun at the selected power and at the selected duration" of claim 15 and "the control system positions the substrate assembly and selects certain plasma guns and controls the amount of power and the duration of operation of the guns in essentially the same operation such that different catalyst materials from each gun are co-deposited with respect to a given target area on the substrate" of claim 19; and "the control system positions the substrate assembly and selects certain plasma guns and controls the amount of power and the duration of

operation of the guns in essentially the same operation such that different catalyst materials from each gun are deposited as layers with respect to each target area on the substrate" of claim 20, note the cluster guns imported from '973 would have required the control of each plasma gun within a cluster and simultaneous co-deposition of '671, col. 18, lines 28-38).

The feedback control of '671 (col. 24, lines 57-59) and feedback control of '525 (col. 11, lines 59-61) are intrinsically based on the operation of "values from an actual sample catalyst material created at a set power, time and composition are compared to expected values and the programmed parameters for power, time and composition for that catalyst material are adjusted if the actual catalyst material values vary from the expected values" of claim 18).

For "the relationship of the number of separately defined target areas in one column (N) to the number of separately defined target areas in an adjacent column is: target areas in column N = X and target areas in adjacent column N+1 = X+1" of claim 10 and " the relationship of the number of separately defined target areas in one row (N) to the number of separately defined target areas in an adjacent row is: target areas in row N = X and target areas in adjacent row N-1 = X-1" of claim 11, it is merely how the columns and rows are viewed. By turning the substrate 45° and name columns and rows in vertical and horizontal direction, the number of spots in each column and row will have a different count of spots (one less) than its neighboring column and row.

2. Claims 13-14, and alternatively for claims 10 and 11, are rejected under 35 U.S.C. 103(a) as being unpatentable over '671, 645, and '525, as applied to claims 21 and 8 rejection above, further in view of Wang et al. (US 20050035002, hereafter '002).

'671, '973, and '525, together, do not teach the limitations of:

Claim 13: the substrate assembly comprises a block configured for maintaining a plurality of cylindrical substrate elements, each cylindrical substrate element individually defining a target area, the cylindrical substrate elements maintained in an array of columns and rows formed within the block, in which upper surfaces of the cylindrical substrate elements comprise the target areas on which catalyst samples are deposited.

Claim 14: the cylindrical substrate elements are inset within the block in a matrix and a plate having a plate matrix of openings concentric with the matrix of elements in the block is applied facing the surface of the block, such that the openings in the plate are aligned with the elements and a cross-section area of an opening in the plate is less than a cross-section area of the surface of the corresponding concentric cylindrical element.

'002 is an analogous art in the field of electric screening system (title) in the detachable electrode arrangement provides an electrode array for combinatorial synthesis ([0067], second last sentence) applicable to physical vapor deposition PVD ([0062], second sentence). '002 teaches cylindrical inserts 38 ([0042]) in a holder 170 includes a holder block 171 and a back plate 180 which holds RDE 20 in place ([0068],

see also [0066], Figs. 15-16), a holder block 171 (Fig. 15 and 16, [0070], the claimed plate) with the openings 172 sized to be slightly smaller than the outside diameter of electrodes 20 for light press fitting of the electrodes 20 to the holder block 171 ([0070], second last sentence, note 20 corresponds to the claimed inset).

At the time of the invention was made, it would have been obvious to a person having ordinary skill in the art to have adopted the holder arrangement including cylindrical insert, a holder block/plate with opening smaller then the electrodes/inset, as taught by '002, in the combined apparatus of '671, '973, and '525, for its suitable use as a holder for the combinatorial synthesis in the PVD system. The selection of something based on its known suitability for its intended use has been held to support a *prima facie* case of obviousness. MPEP 2144.07.

For claims 9 and 10, Figs. 15 and 16 of '002 clearly shows the relationship of column and row having the one less (or more) spots than neighboring column and row.

Response to Arguments

Applicant's arguments filed on 08/19/2011 have been fully considered but they are unconvincing in light of the new grounds of rejection above.

3. Applicants argued that Stirn '645's guns is not co-focused because the substrate is rotational, see the bridging paragraph of pages 7 and 8.

This argument is found not persuasive.

The examiner maintains that the guns is co-focusing on the substrate as shown in the figure. The rotational substrate does not affect the focus.

To further clarify the focus of the guns, the examiner cites a new reference '973 which expressly teaches the focus on the substrate in the Specification (col. 4, lines 16-22, Fig. 1).

4. Applicants further argued that '645's rotating substrate would not work in '671's apparatus which is deposit material in a pattern, see the first complete paragraph of page 8.

This argument is found not persuasive.

The examiner maintains the replacing of '671's individual sputtering gun with the cluster guns of '645 clearly workable in '671's apparatus. A person of ordinary skill in the art would not have replaced the substrate holder of '671 with the substrate holder of '645 (or of the '973).

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. US 20030082587 (Fig. 6, A3) and 6996550 (Fig. 3, the drawing on right hand side) each shows the relationship of columns and rows of claims 10 and 11.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to KEATH CHEN whose telephone number is (571)270-1870. The examiner can normally be reached on 6:30AM-3 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on 571-272-1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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/KEATH T CHEN/
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